

Energy Enhancements - Charettes Army Reserve Pilot Projects



**Hotel Monaco - Alexandria, VA
7-8 June 2011
Doug Pohl R.A.**



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Process vs. Criteria

Change design approach from a **Criteria** focus to a **Process** focus.



How?

- > Shift focus from obtaining LEED credits to creating strategies for achieving net zero energy, net zero water, net zero waste.
- > Drive down overall building energy requirement so that *renewables* can cost effectively supplement or replace fossil fuels.



Army Reserve Pilot Projects

Goal 1: Determine impacts (costs, effort) of achieving the next level of energy reduction requirement

- ▶ Estimated to be 50% to 65%. Costs to get to 80% and net zero
- ▶ The projects will utilize a whole building design approach

Goal 2: Develop new requirements and processes for energy reduction

- ▶ New criteria implemented in Design Guide, Specs, etc
- ▶ Energy Analysis incorporated into the early stages of the design process (charrette) and continued throughout.

Goal 3: Investigate LEED Gold Rating

- ▶ Also determine costs and impacts of achieving Platinum

~~**Goal 4: Investigate renewable energy opportunities.**~~

- ▶ Wind, Solar, Geothermal, ⁴ other?



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Army Reserve Pilot Projects

- ▶ Determine energy strategies before design charette
 - Focus on passive design (Free Energy)
 - Renewable Energy
- ▶ Perform Energy Modeling
 - Climate data (temperatures, wind, sunlight, rain, etc)
 - Generic building in designated climate zone
 - Focused project on energy concerns and opportunities for region
- ▶ ROM costs of implemented technologies

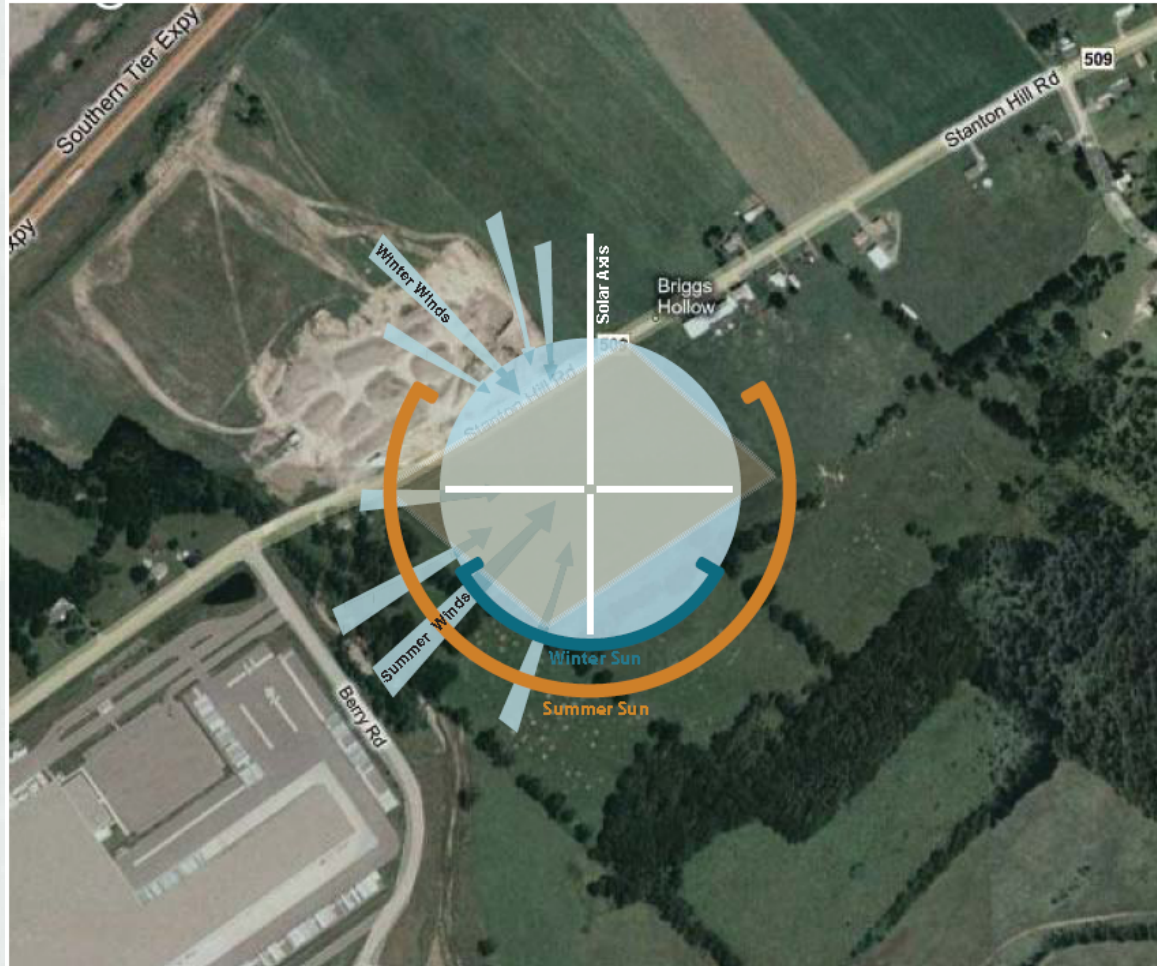


Army Reserve Pilot Projects

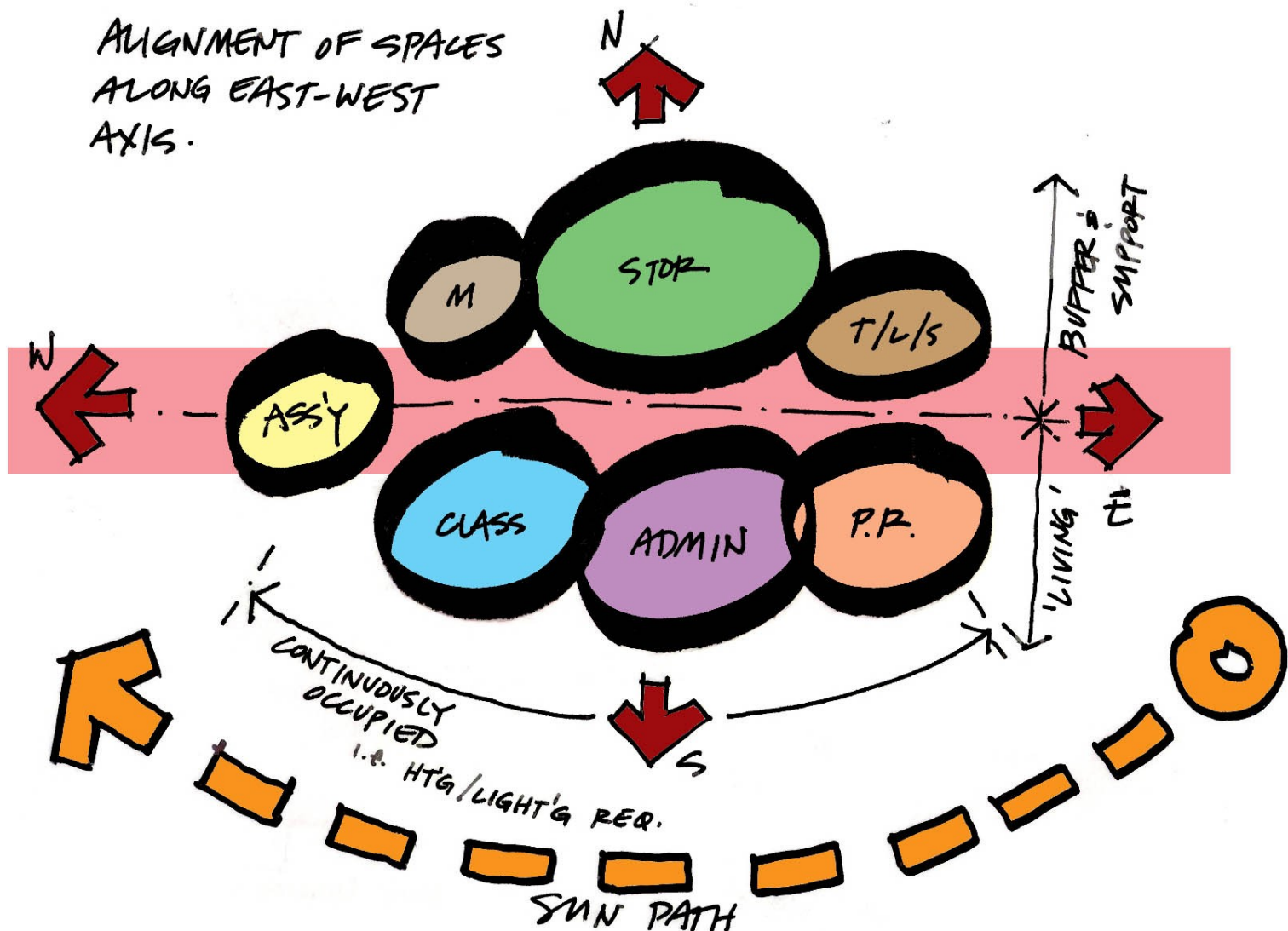
- MCAR PN 69599, ARC/OMS/UHS, Binghamton, NY
 - ▶ PA \$13.4M including land acquisition
 - ▶ Army Reserve Center (ARC) 34,840 SF
 - ▶ Organizational Maintenance Shop (OMS) 8,192 SF
 - ▶ Unheated Storage UHS) 1,369 SF
- MCAR PN 68582, ARC/OMS/UHS, Las Cruces, NM
 - ▶ PA \$11.4M including land acquisition
 - ▶ Army Reserve Center (ARC) 32,096 SF
 - ▶ Organizational Maintenance Shop (OMS) 4,841 SF
 - ▶ Unheated Storage (UHS) 1,065 SF



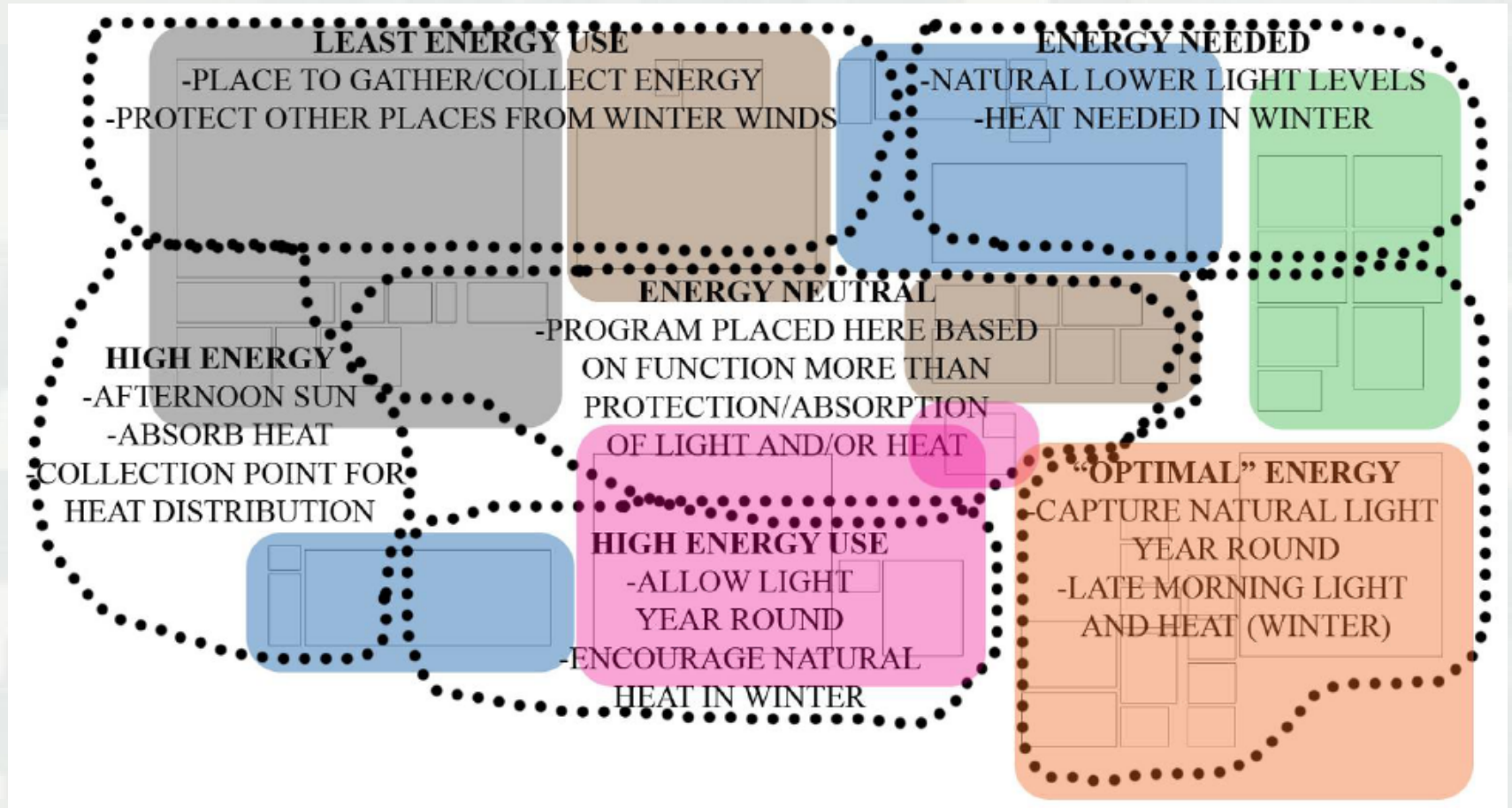
Energy Charette – Binghamton NY Site Sun & Wind



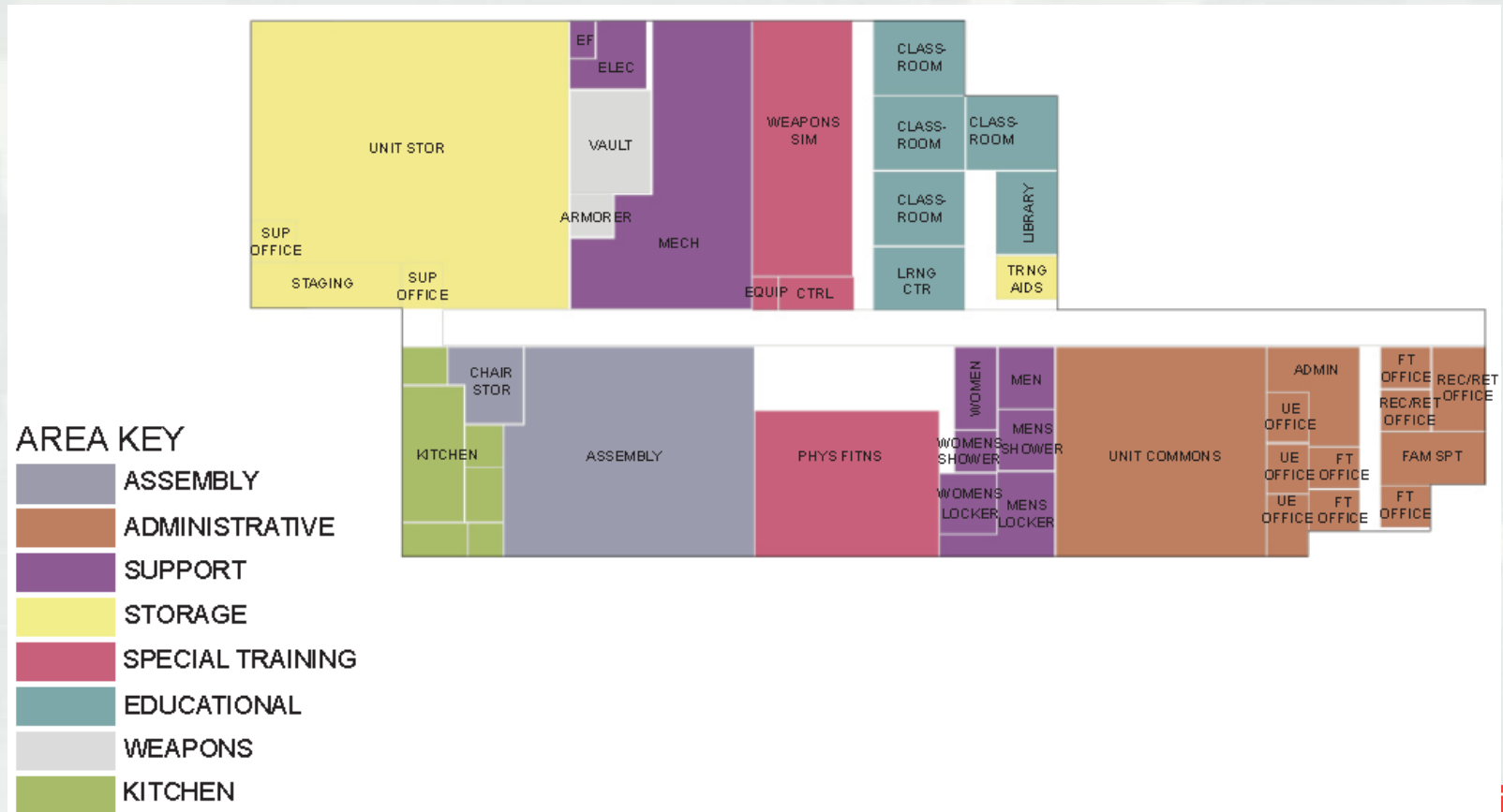
Binghamton NY – bubble diagram



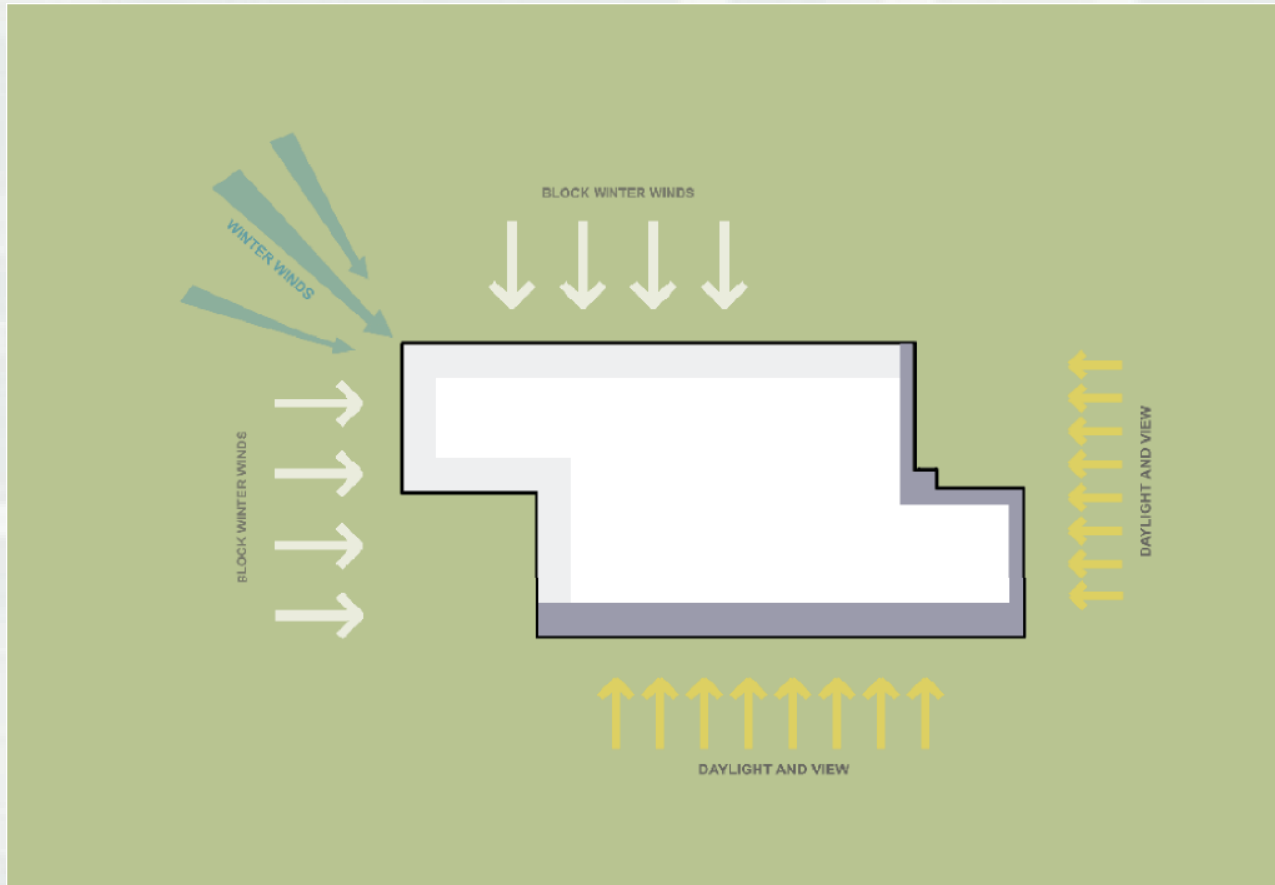
Binghamton NY - Floor Plan/Energy Use Analysis



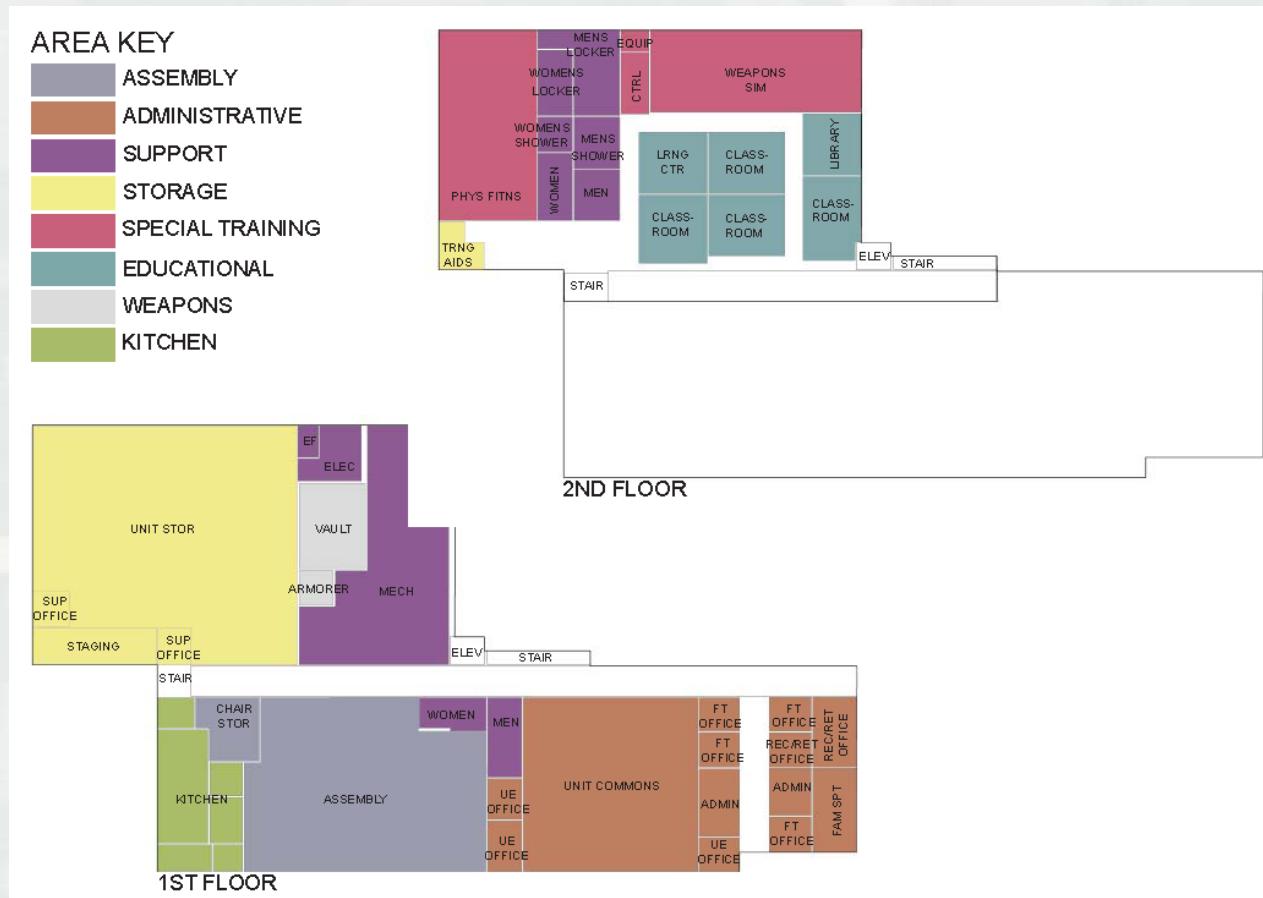
Binghamton NY – possible single story floor plan



Binghamton NY- effects of daylight & wind



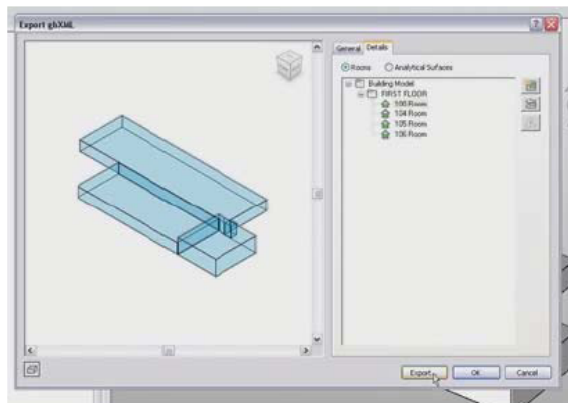
Binghamton NY- possible two story plan



Binghamton NY- BIM to HEVACOMP

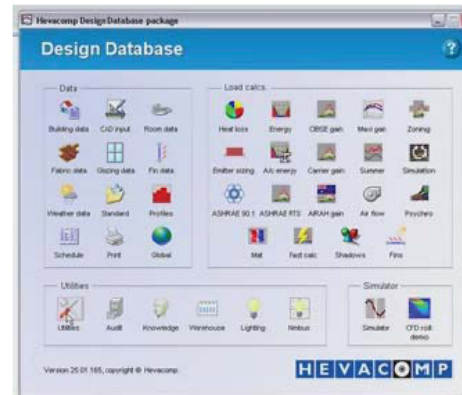
STEP 4: EXPORT AND SAVE FILE

Export Button and save file:



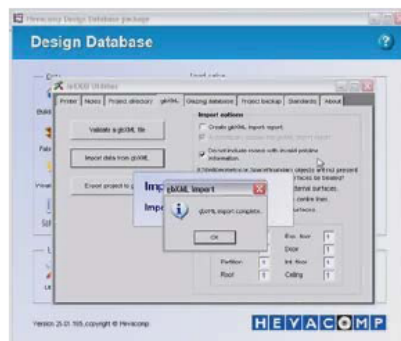
STEP 5: HEVACOMP UTILITIES DATABASE

Hevacomp Utilities:



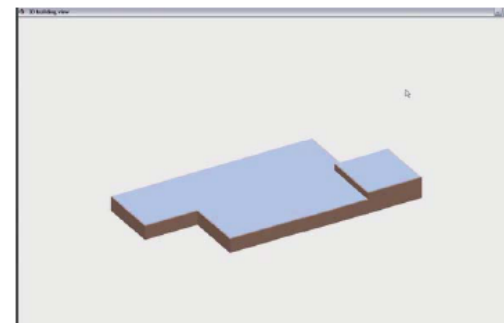
STEP 6: IMPORT GBXML

Import gbXML:

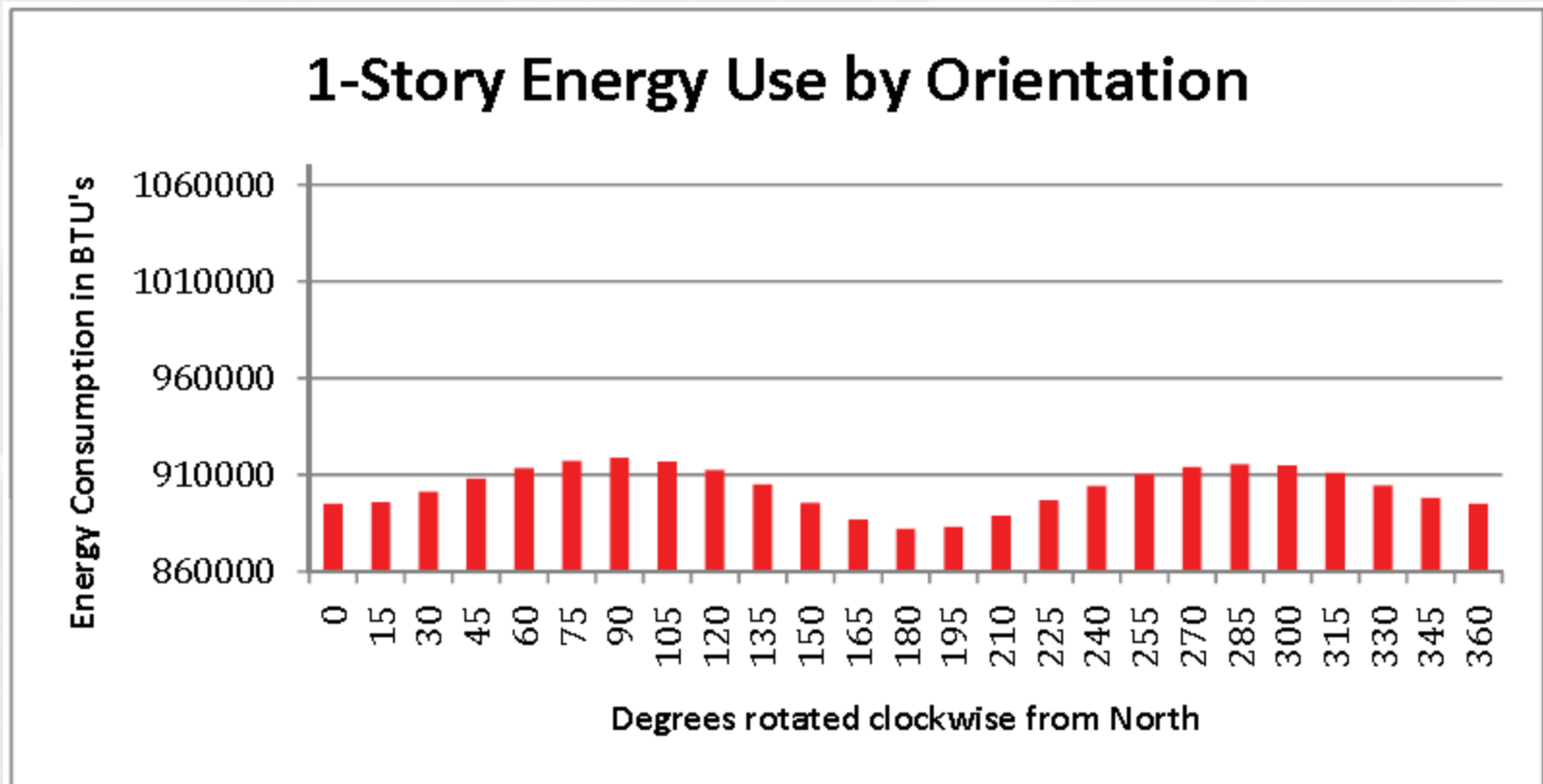


STEP 7: VIEW GEOMETRY

View geometry:

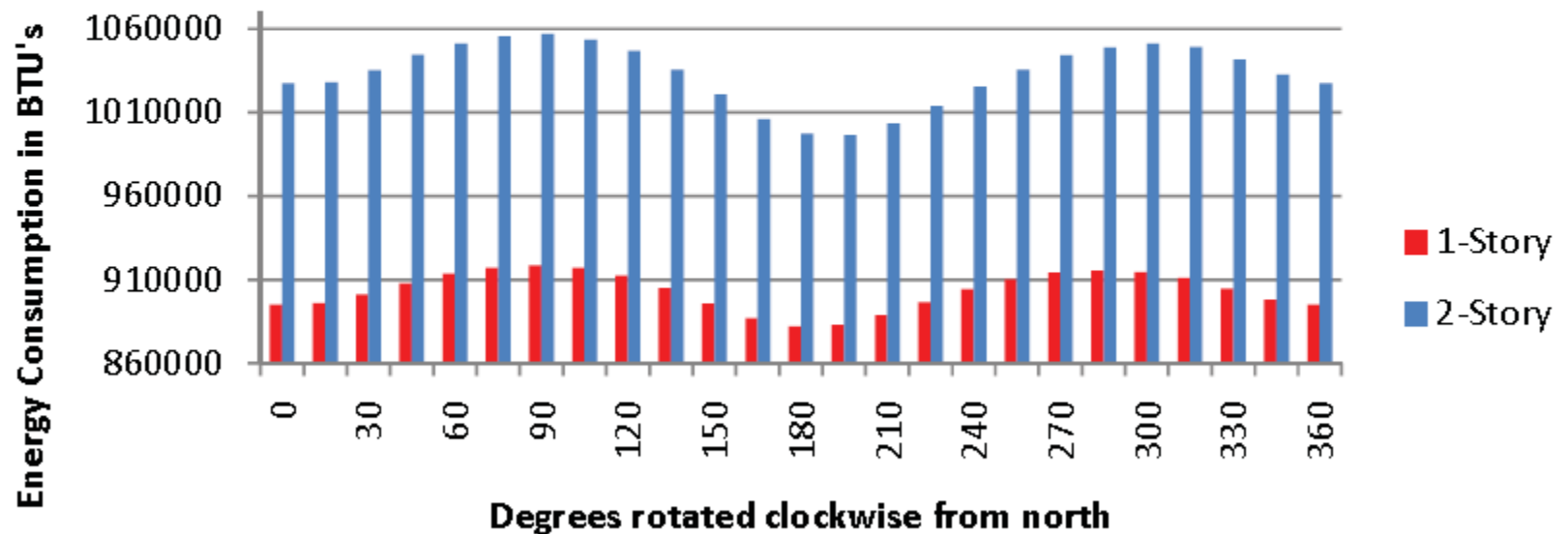


Binghamton NY- HEVACOMP one story orientation



Binghamton NY-HEVACOMP 1 & 2-story comparison

1 Story VS 2-Story Energy Use by Orientation



Binghamton NY- initial energy analysis

THIS PROJECT ONLY!



A ONE STORY BUILDING USES LESS ENERGY THAN A TWO STORY BUILDING



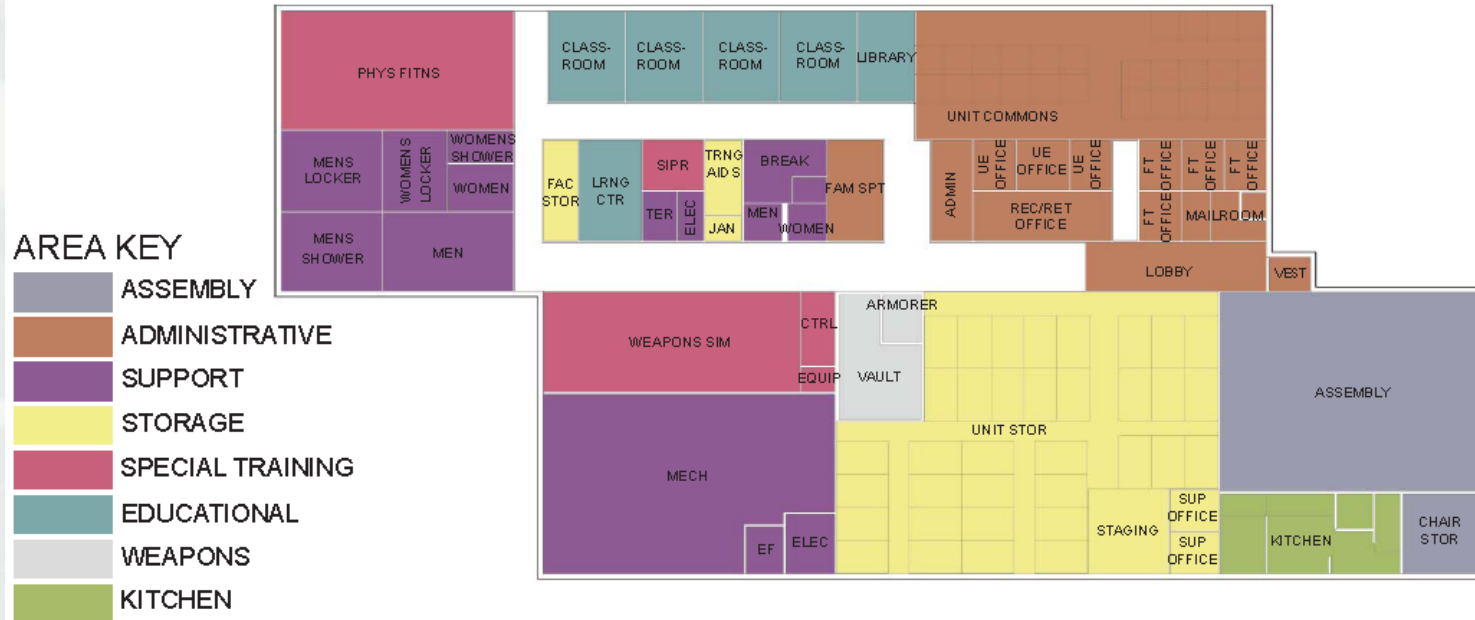
A LONG, NARROW FLOOR PLAN ORIENTED ALONG THE EAST-WEST AXIS IS OPTIMAL



GLASS ON THE NORTH FACE OF THE BUILDING IS MOST EFFICIENT FROM AN ENERGY STANDPOINT



Binghamton NY- Scheme A roof analysis



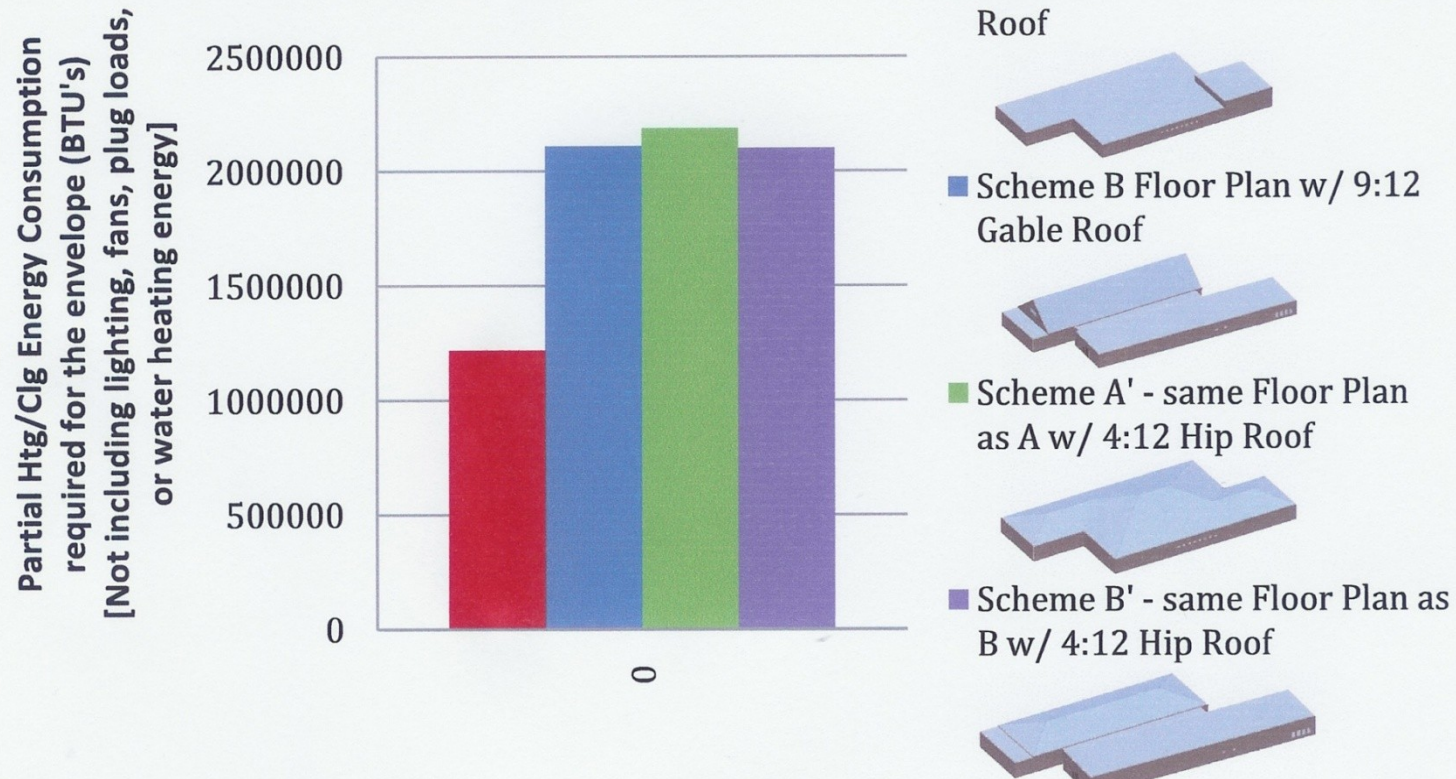
Binghamton NY- Scheme B - roof analysis



Binghamton NY Schemes A & B

Roof Influence on Energy Consumption

Scheme A vs. B vs. A' vs. B'



Binghamton NY-Initial site plan



Binghamton NY- Final Site Plan



- Solar Wall
- Vegetative Roof
- Geothermal



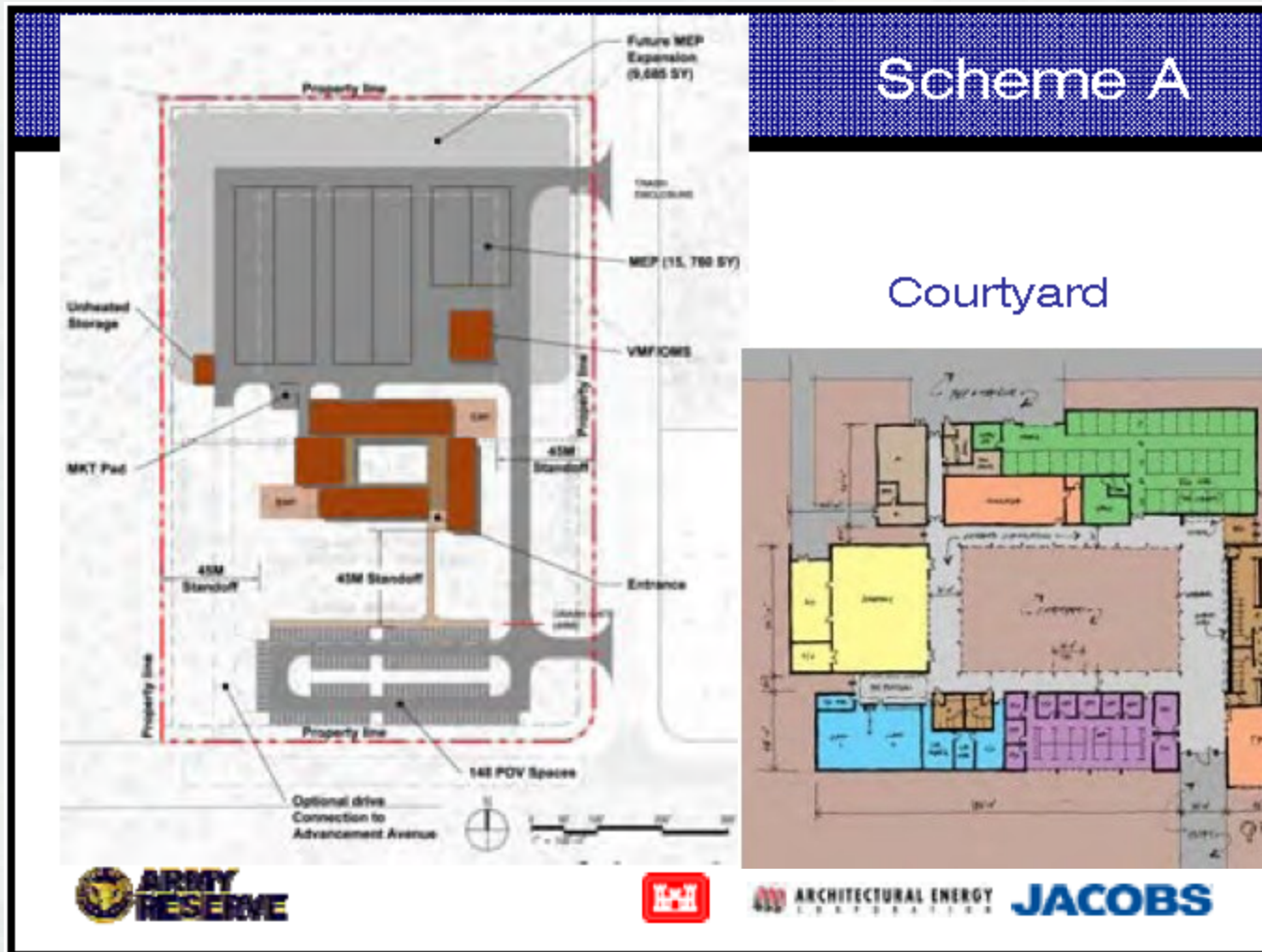
Binghamton NY-Entry elevation



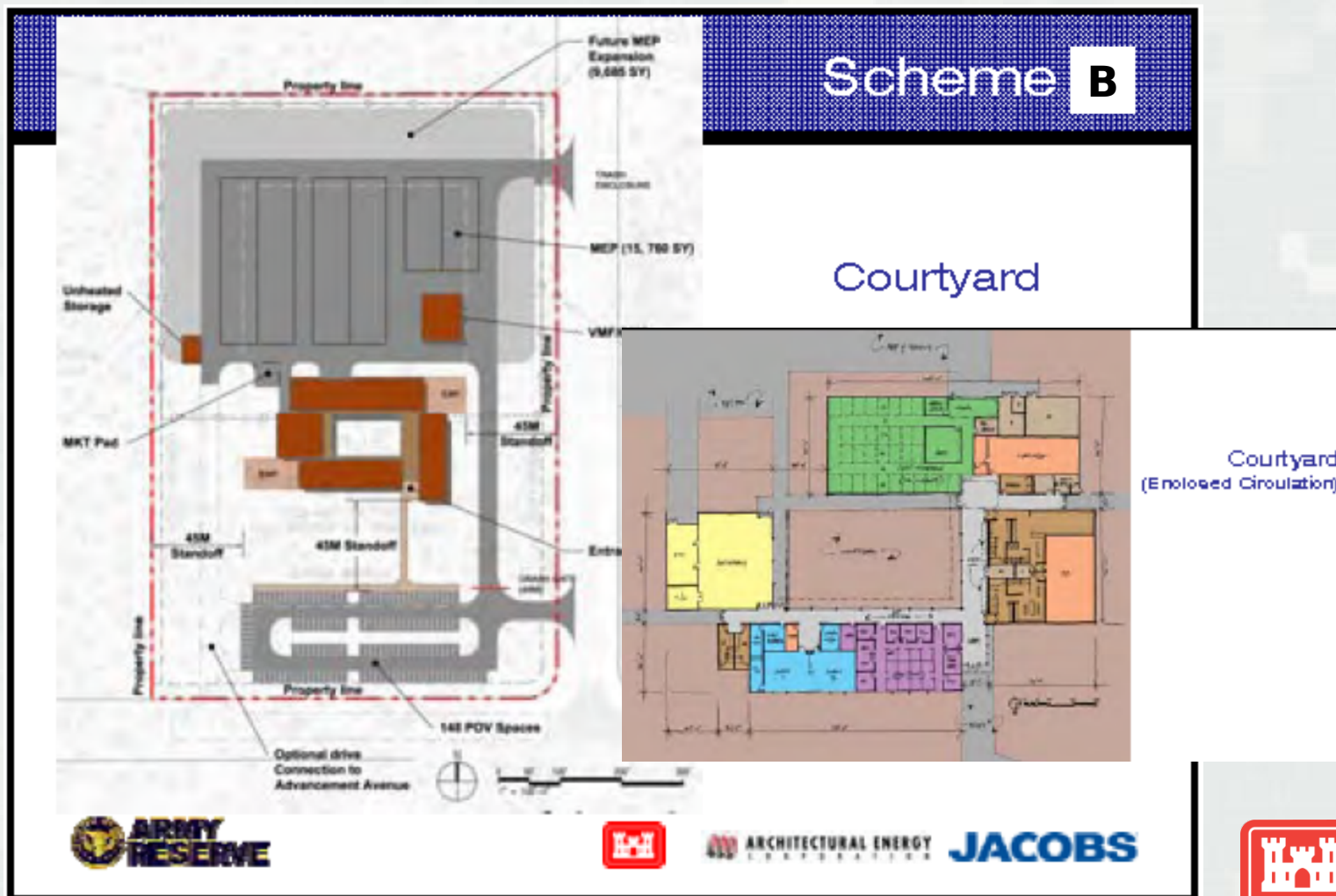
Las Cruces NM- project site



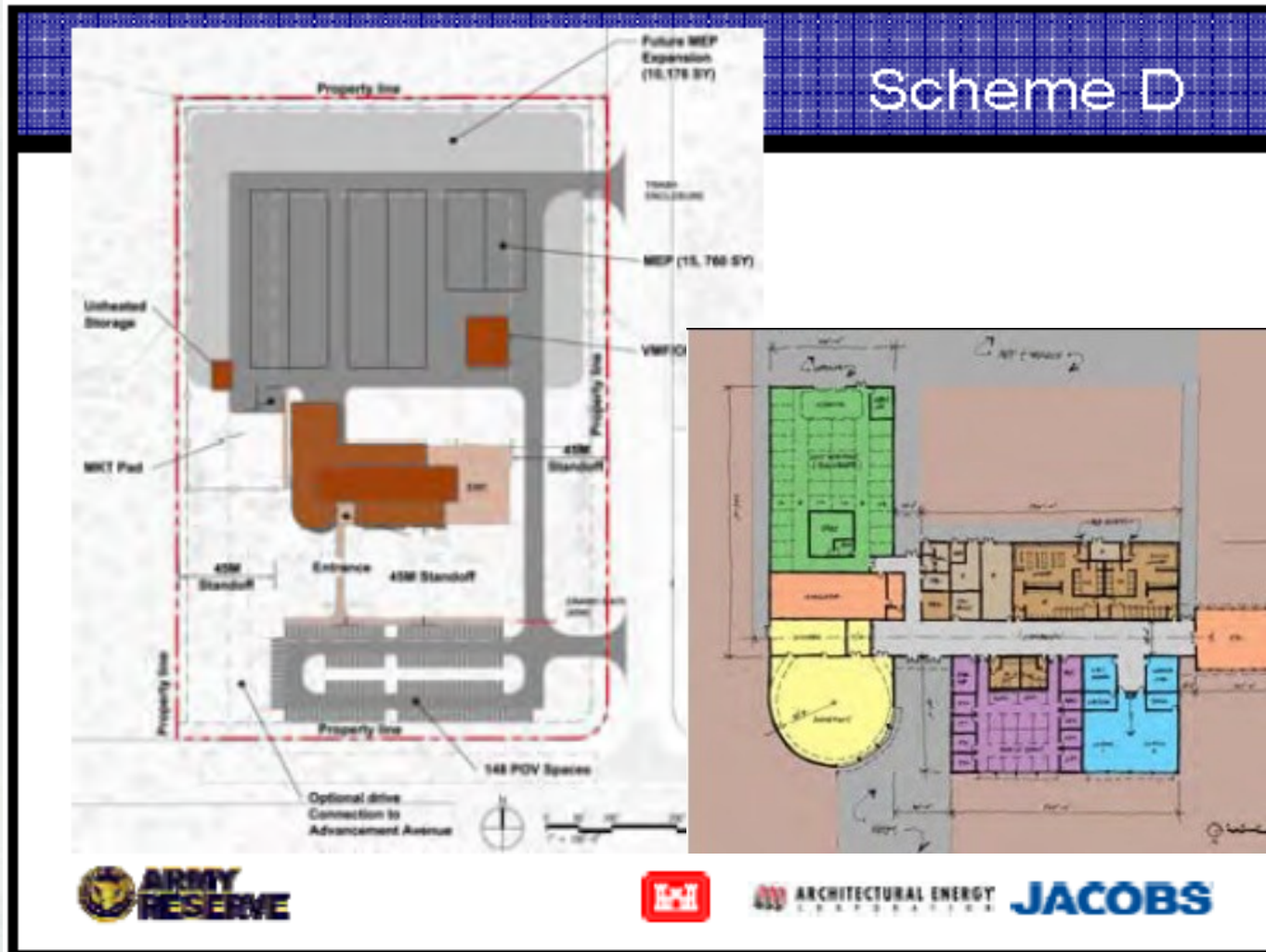
Las Cruces NM- Scheme A



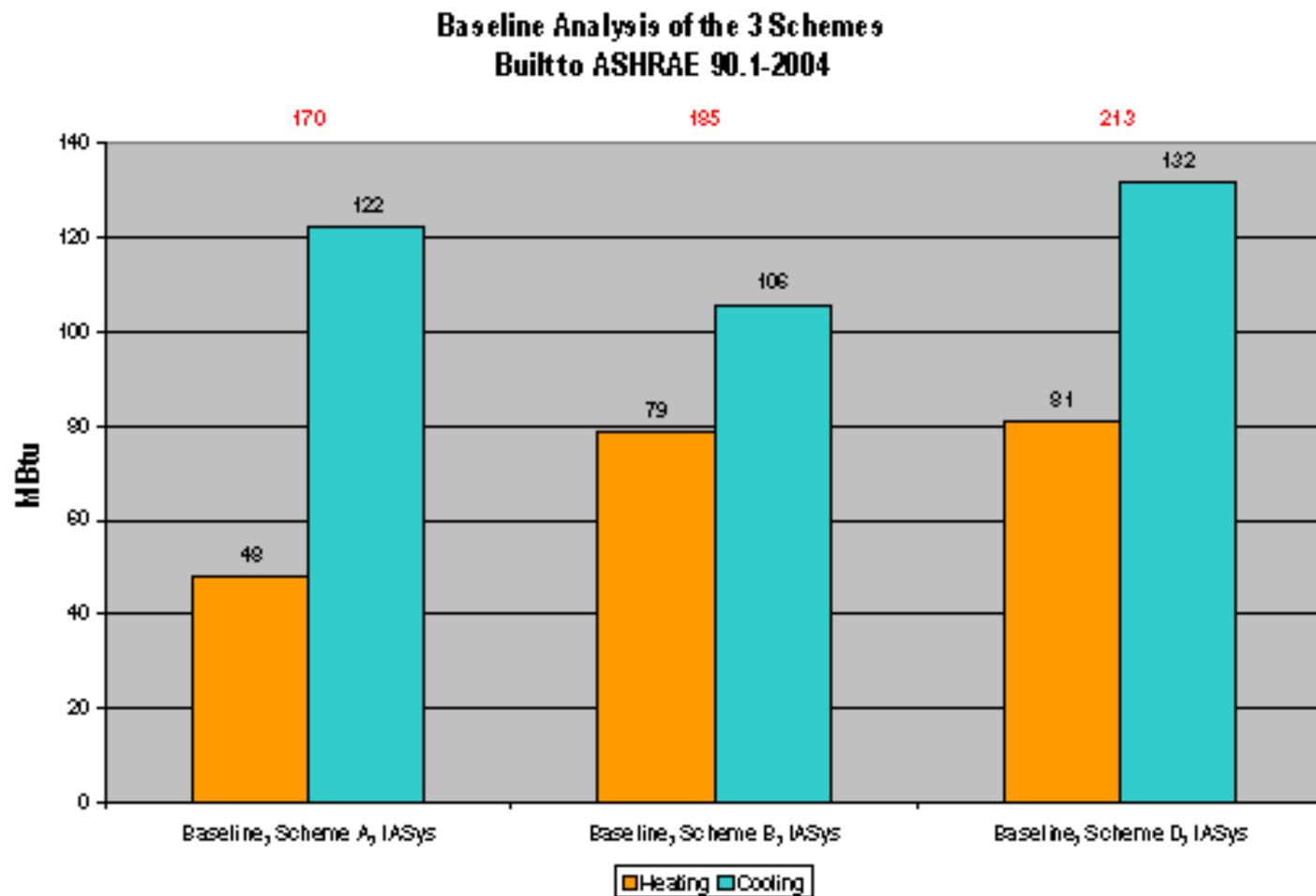
Las Cruces NM- Scheme B



Las Cruces NM- Scheme D



Las Cruces NM- Schemes A, B, D



Las Cruces NM- composite revised scheme

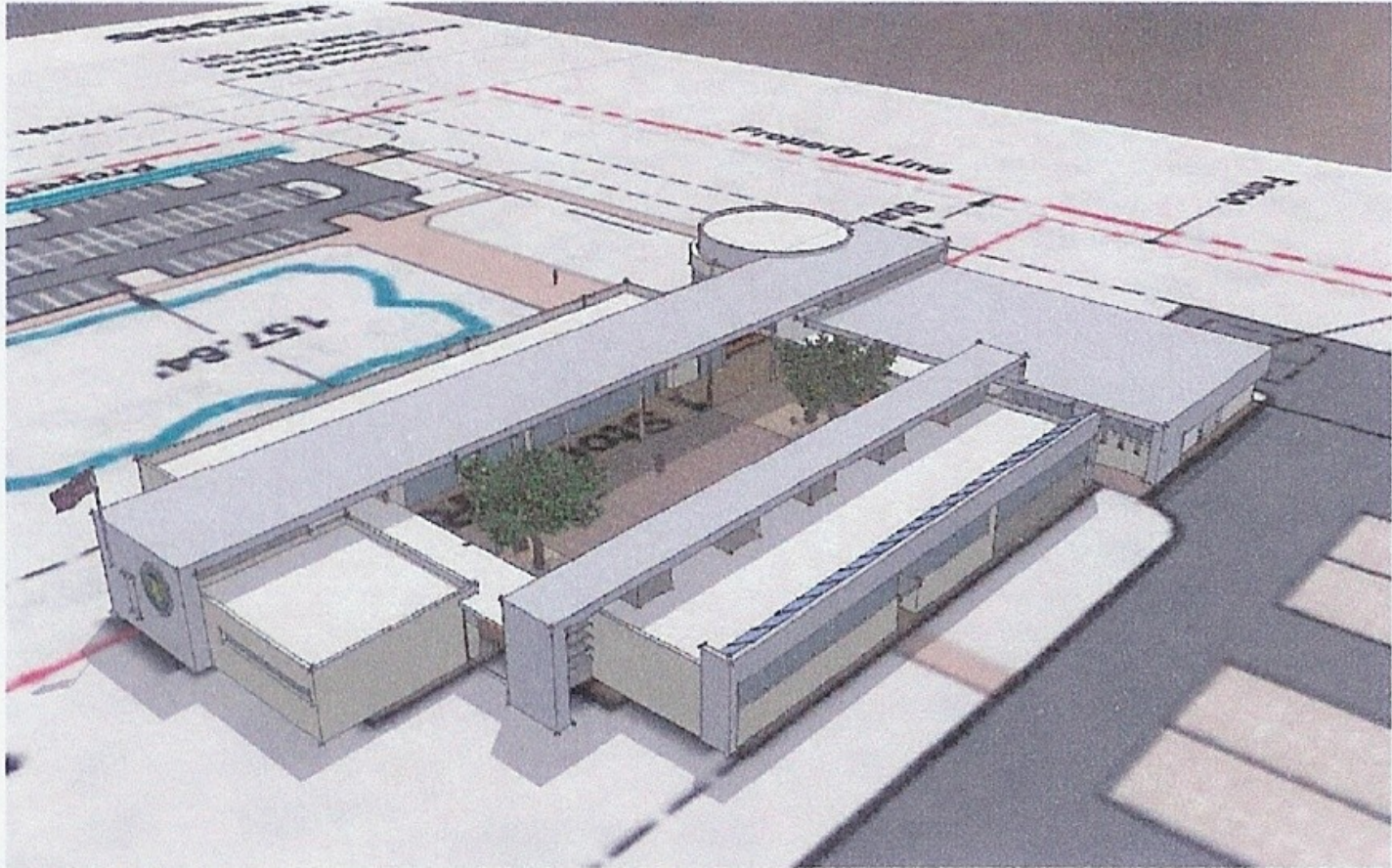
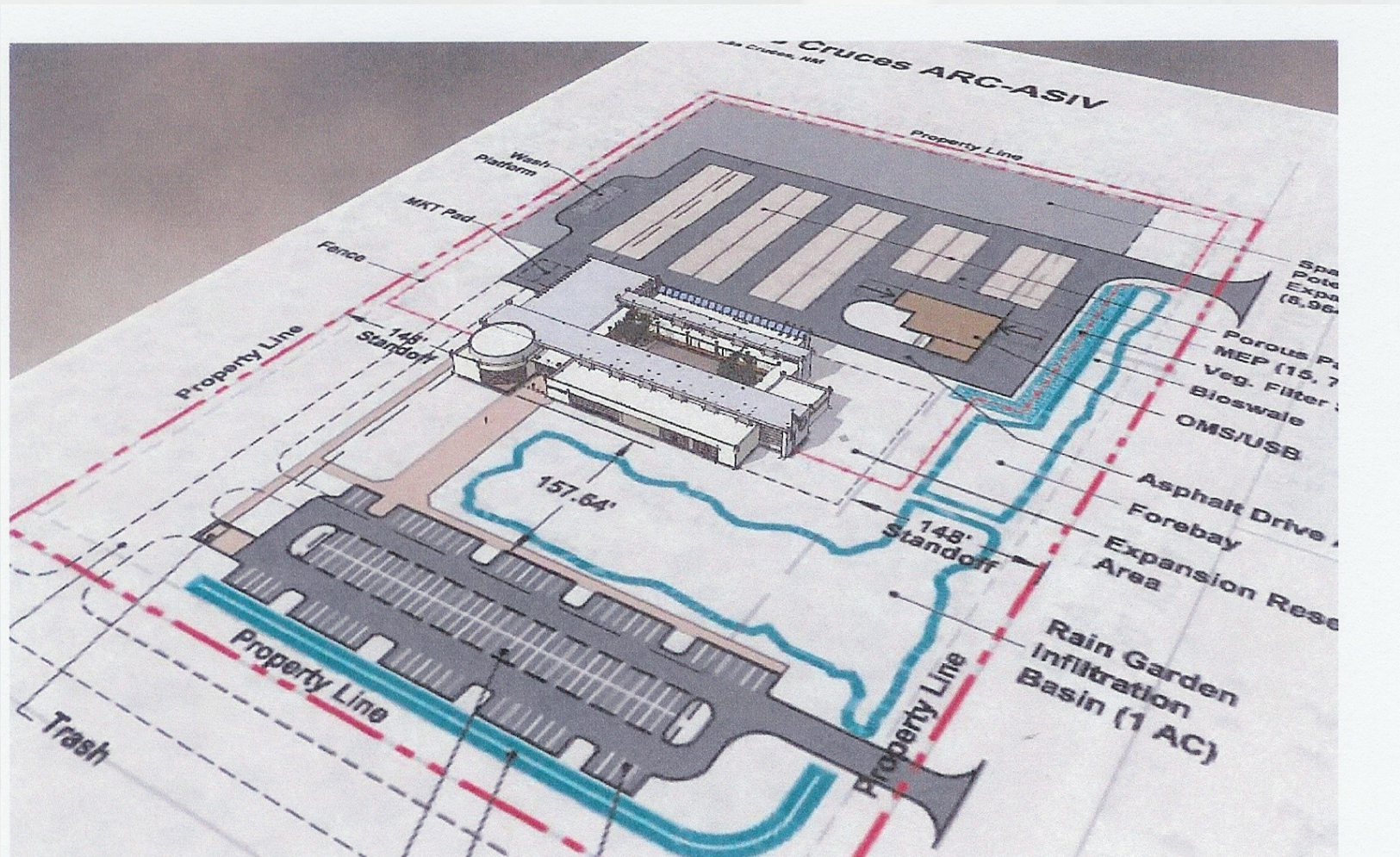


Figure 4.4-10: Training Views - Aerial from Northeast

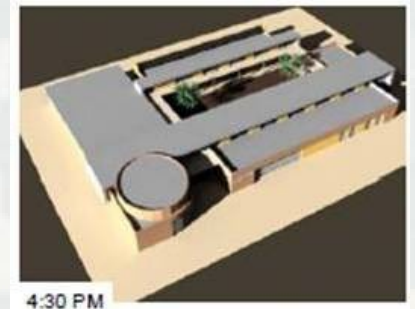
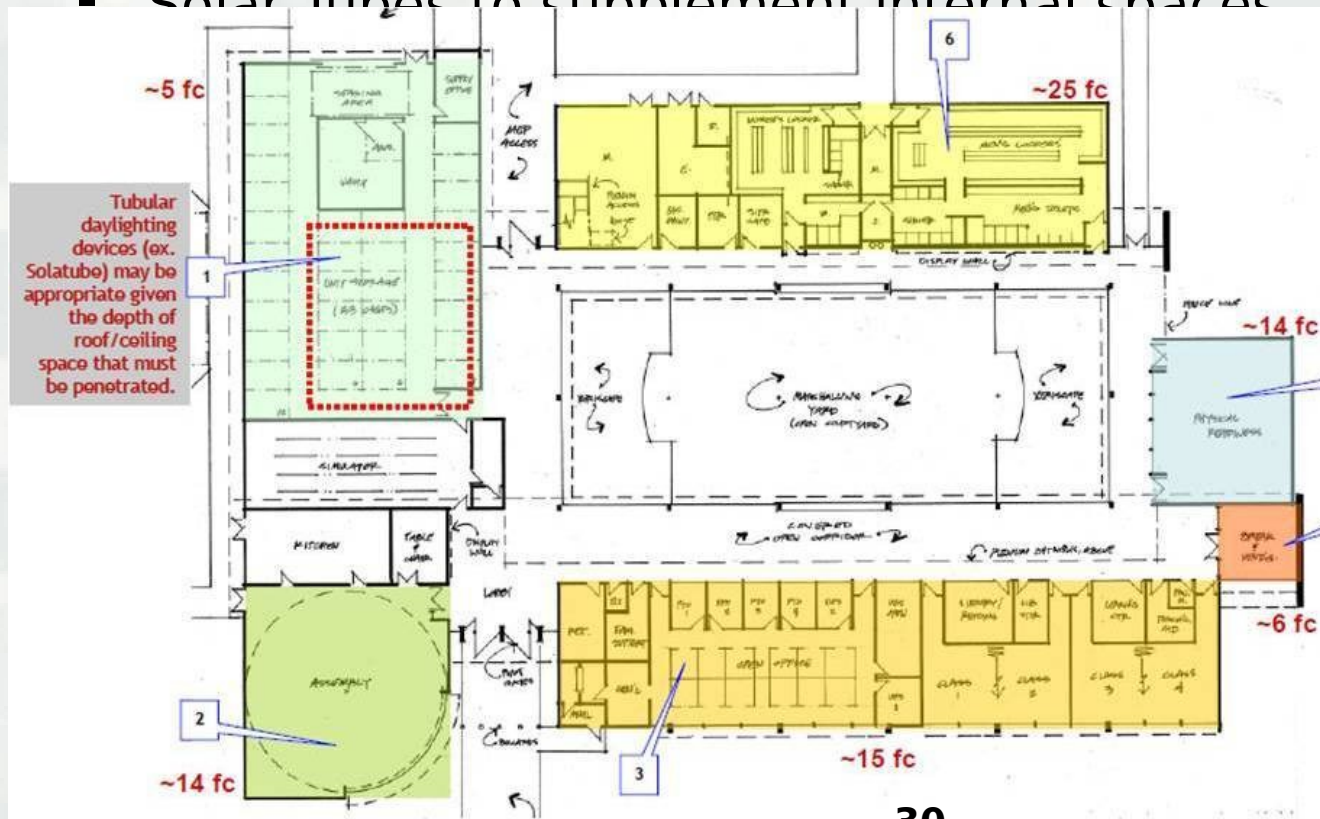


Las Cruces NM- Initial site plan



Daylight Modeling

- Daylight modeling - incorporates solar shading and controls heat gain – Maximizes natural daylight (96% Las Cruces)
- Solar Shades
- Zoned light sensors to control lighting levels
- Solar Tubes to supplement internal spaces



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Las Cruces, New Mexico



Las Cruces NM



Rainwater harvesting in courtyard



Las Cruces NM Features

Rammed earth (thermal mass) construction - 60% energy reduction.

PV canopies over POV parking

Roof mounted PV

96% of spaces natural daylight

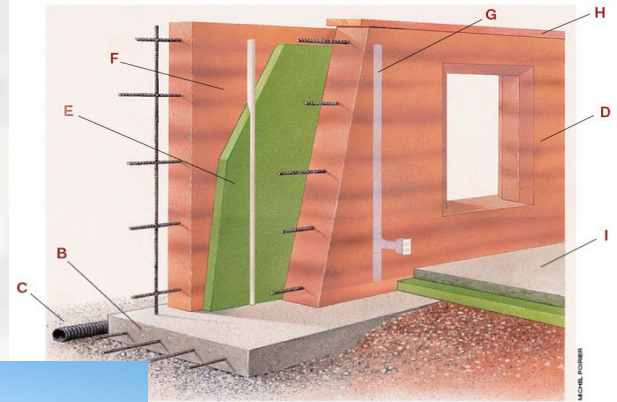
Solar hot water

Solar walls

Rainwater harvesting

Enhanced Commissioning

Projected LEED platinum



Results- Army Reserve Pilot Project

Observations

- Geographic location heavily influences sustainable design measures.
- NO ONE SIZE FITS ALL – Every project is different. Explore Regional and Site Specific Opportunities
- Design process has more impact than criteria.
- Standard ARC designs would probably be less energy efficient than custom designs.
- The energy model is an extremely useful tool for making design decisions.

Next Steps

- Implement energy modeling early in design for all projects
- Focus on Energy, Water and Waste reduction Goals in early design meetings



Results- Army Reserve Pilot Project (cont'd)

- Perform LCCA on all Major Systems (exceed 1% PA)
- LCCA of an Energy Initiative is NOT deciding factor, but one factor that should be considered
- LCCA, along with other pros and cons, shall be presented to Army Reserve Installation Management (ARIM-D) for determination.

Design energy reduction and efficient systems into the project PA

- When right sizing and balancing, place emphasis on energy

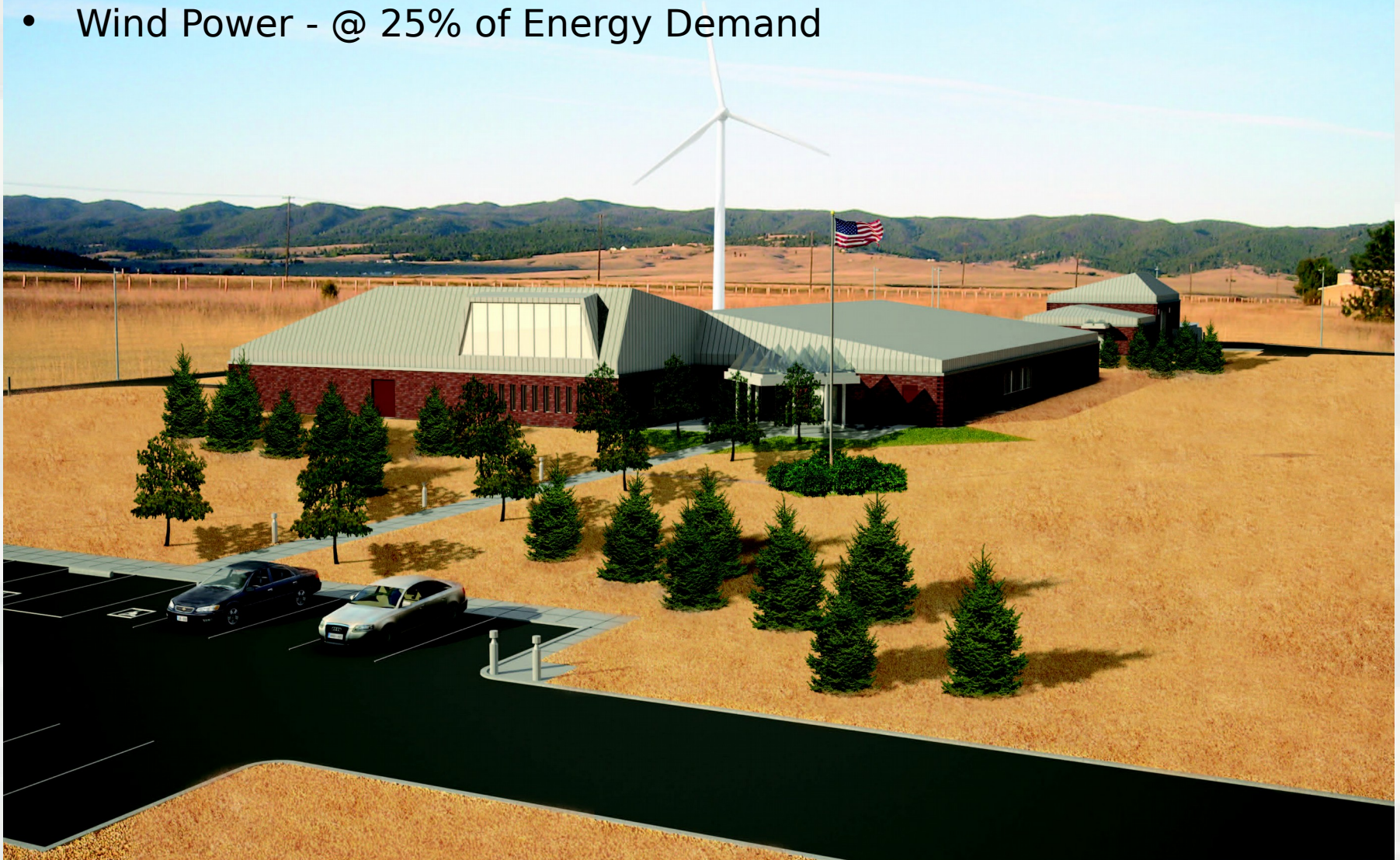


Consider renewable energy as bid options if above PA

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Butte, MT ARC

- LEED Gold Certified (Spring 2011) – First LEED Gold Project
- Wind Power - @ 25% of Energy Demand



Los Alamitos, CA ARC

- **Solar Photovoltaic**
 - ▶ Net-zero electric consumption
 - ▶ Incorporated as POV parking canopies
 - ▶ LEED Gold



Newport, RI ARC

- **Achieved Over 40% Energy Reduction**
- **9 of 10 EA (Energy and Atmosphere) LEED Credits**
- **High Solar Reflective Roof (+71 SRI)**



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Denton, TX ARC



- **Ground Source Heat Pumps**
- **Rainwater Collection for Toilet Flushing and Wash Bay**
- **Increased Insulation and Air Barrier**

Bryan, TX ARC

- **Insulated Concrete Forms**
- **HVAC - High Efficiency/Energy Recovery**
- **Geothermal**



Tallahassee, FL ARC

- Orientation to allow day lighting into occupied spaces
- Low Impact Design
- Roof Mounted Photovoltaic (57% energy savings with photovoltaic)



Questions

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